WYLE LABORATORIES - RESEARCH STAFF

TECHNICAL MEMORANDUM 66-37

NOTE ON SHADOWGRAPH CONTINUATION EXPERIMENTS (TM66-27) AND PROGRAM FOR DEFLECTOR EXPERIMENTS

Submitted Under Contract NAS 8-11312

Prepared by R C Potts.
R. C. Potter

Approved by
L. C. Sutherland
Research Operations Manager

Date November 9, 1966

COPY NO. 25

1.0 NOTE ON CONTINUATION EXPERIMENTS

The experiments outlined in Wyle Technical Memorandum 66-27 were for the original nozzle used in the initial experiments to determine optimum film-jet-source spacing. It is now proposed to use the new 1 inch exit diameter nozzle designed to give a perfectly expanded flow. This nozzle is designed for an exit Mach number of 2.5, as opposed to the original nozzle with an exit Mach number of 2.8. Therefore, the pressure ratios for the nozzle will be different from those given in TM 66-27. The revised figures for the experiments are:

Test 1 Photograph of a Complete Acoustic Field

An initial acoustic test on this nozzle suggests that perfectly expanded flow occurs at a pressure ratio of 12.27:1. This gives an exit Mach number of 2.29. The tests of this phase should therefore be completed at this pressure ratio. Operation pressure will be

12.27 x Atmospheric Pressure

Test 2 Vary Nozzle Pressure Ratio

Four runs are called for. The suggested supply total pressures are now

360 psia (or as high as possible)
270 psia
135 psia
90 psia

Test 3

Jet operated at normal pressure ratio in all tests, as determined for Test 1. This will be about 180 psia. All other parameters will still be the same.

2.0 DEFLECTOR TESTS

2.1 Introduction

The following series of experiments involves 11 runs, each, with a shadowgraph picture to examine the effect of a deflector on the locally radiated "Mach Wave" field.

The proposed deflector is shown in Figure 1, and has the following dimensions:

Deflector Plate, 16 in x 16 in.

2.2 Set-up of Apparatus

The deflector plate is located such that the jet axis center-line passes through the center point of the plate, which is set at the angle θ to the flow. The distance of the plate center point to the jet nozzle exit is x. The source is set up perpendicular to the jet axis and exactly opposite the center point of the deflector on the forward side of the plate. The film is positioned so the leading edge is opposite the nozzle exit and it extends 2 inches below the jet center line, as indicated in Figure 1.

2.3 The Test Runs

Table I lists all the relevant parameters for the test runs. In all cases the spark to jet distance is 8 feet, and the jet to film distance is 1.5 feet.

TABLE 1

DEFLECTOR EXPERIMENTS

Run Number	Nozzle Applied Pressure (psia)	Distance of Deflector from Jet x (in.)	Angle of Deflector to Jet θ (degrees)
1	N	16	45
2	N	8	45
3	N	4	45
4	270	16	45
5	270	8	45
6	270	4	45
7	135	16	45
8	135	8	45
9	135	4	45
10	N	16	30
11	N	16	60

Notes, N, means normal pressure for perfectly expanded flow, nominal value = 180 psia. Runs 10 and 11 may be neglected initially if it proves difficult to vary the deflector angle.

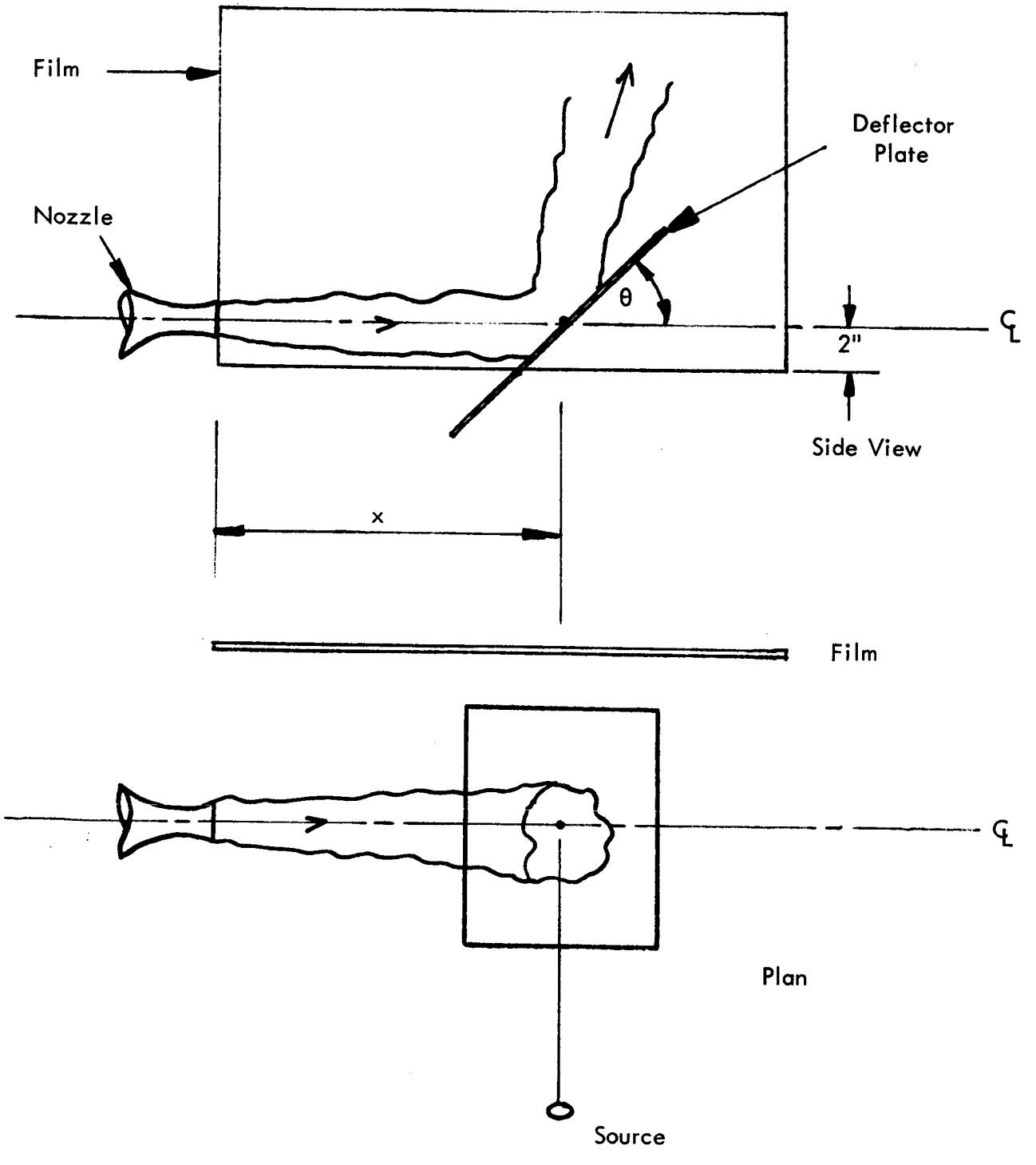

Figure 1: Deflector Plate Experiment